

Rebecca Ciez

Assistant Professor
Mechanical Engineering, Environmental and Ecological Engineering
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EDUCATION

Carnegie Mellon University, College of Engineering, Pittsburgh, PA
Ph.D. Engineering and Public Policy, 2018

Columbia University, School of Engineering and Applied Science, New York, NY
B.S. Mechanical Engineering, Economics & Sustainable Engineering Minors, 2013

EXPERIENCE

Purdue University, Mechanical Engineering, Environmental and Ecological Engineering, West Lafayette, IN

Assistant Professor (2020-Present)

Columbia University, Chemical Engineering, New York, NY

Postdoctoral Research Scientist (2020)

Andlinger Center for Energy and the Environment, Princeton University, Princeton, NJ

Distinguished Postdoctoral Fellow (2018 – 2020)

Carnegie Mellon University, Engineering and Public Policy, Pittsburgh, PA

Graduate Research Assistant (2013 – 2018)

ASME, Washington DC

Public Policy Research Intern (2014)

SELECTED HONORS AND AWARDS

Scialog Fellow, Negative Emissions Science, Research Corporation for Science Advancement (2022)

Andlinger Distinguished Postdoctoral Fellowship (2018-2020)

NSF Graduate Research Fellowship (2015-2018)

PUBLICATIONS

13. Kelsey Bischoch, Mohammad Rezaqalla, Aaron Farha, Alexandru Boanta, **Rebecca E. Ciez***, *Development of a High-Resolution Top-Down Model to Estimate Actual Household-Level Heat Pump Electricity Consumption*, Environmental Research: Infrastructure and Sustainability. *Accepted*
12. Aashutosh Mistry, Ankit Verma, Shashank Sripad, **Rebecca Ciez**, et al. *A Minimal ‘Information’ Set to Enable Verifiable Theoretical Battery Research*. ACS Energy Letters, **6**, (2021)
11. John J. Lydon, **Rebecca E. Ciez**, *Existing seasonal flexibility in U.S. manufacturing energy use*. IOP SciNotes, **2**, (2021)

10. David L. Greene, Judith M. Greenwald, **Rebecca E. Ciez***, *U.S. fuel economy and greenhouse gas standards: What have they achieved and what have we learned?*, Energy Policy, **146**, (2020)
9. Guannan He, **Rebecca E. Ciez**, Qixin Chen, Panayiotis Moutis, Soumya Kar, Jay Whitacre*, *The Economic End of Life of Electrochemical Energy Storage*, Applied Energy, **273**, (2020)
8. Eric Hittinger*, **Rebecca E. Ciez**, *Modeling the costs and benefits of energy storage systems*, Annual Review of Environment and Resources, **45**, (2020)
7. **Rebecca E. Ciez**, Daniel Steingart*, *Asymptotic Cost Analysis of Intercalation Lithium Ion Systems for Multi-Hour Duration Energy Storage*, Joule, **4**, 1-18 (2020)
6. **Rebecca E. Ciez**, J.F. Whitacre*, *Examining different recycling processes for lithium-ion batteries*. Nature Sustainability, **2**, 148-156, (2019)
5. Kevin Knehr, Robert Buline, Todd Baldwin, Erick Guzman, Hang Huynh, **Rebecca E. Ciez**, Daniel Steingart*, *Optimization and Design of the Minimal Architecture Zinc-Bromine Battery using Insight from a Levelized Cost of Storage Model*, Journal of the Electrochemical Society **165**, A4041-A4050 (2018)
4. Brian Sergi, Matthew Babcock, Nathaniel J. Williams, Jesse Thornburg, Aviva Loew, **Rebecca E. Ciez***, *Institutional Influence on Power Sector Investments: A Case Study of Distributed and Centralized Energy in Kenya and Tanzania*, Energy Research and Social Science **41**, 59-70 (2018)
3. **Rebecca E. Ciez**, J.F. Whitacre*, *Comparison between cylindrical and prismatic li-ion cell costs using a process based cost model*, Journal of Power Sources **340**, 273-281 (2017)
2. **Rebecca E. Ciez**, J.F. Whitacre*, *The cost of lithium is unlikely to upend the price of Li-ion storage systems*, Journal of Power Sources **320**, 310-313 (2016)
1. **Rebecca E. Ciez**, J.F. Whitacre*, *Comparative techno-economic analysis of hybrid micro-grid systems utilizing different battery types*, Energy Conversion and Management **112**, 435-444 (2016)

CONFERENCE PRESENTATIONS

14. Kelsey Biscocho*, Mohammad Rezqalla, Davide Ziviani, Rebecca Ciez, *Geospatial and Social Factors Affecting Equitable U.S. Heating Electrification*, INFORMS Annual Meeting, October 18, 2023.
13. *Leveraging industry as energy storage for a decarbonized grid*, USAEE/IAEE North American Virtual Conference, November 1-2, 2021
12. *Power-to-X: Evaluating Commodities For Long-duration Storage*, INFORMS Annual Meeting, October 24-27, 2021
11. *A Power Framework for Making Decarbonization Technology Decisions and a case study of transportation*, AGU Fall Meeting, December 2020

10. *Power-to-X: Evaluating Commodities as Long-Duration Energy Storage*. ECS PRiME,, October 2020 (Invited)
9. *Effectiveness of expert judgment in technology innovation*. USAEE/IAEE North American Conference, Denver, CO, November 6, 2019.
8. *Batteries for environmental goals*. AIChE Center for Energy Initiatives Battery and Energy Storage Workshop, New York, NY, October 22, 2019. (Invited)
7. *Recycled Battery Materials for Electric Vehicles: Cost and Consumer Perceptions*. USAEE/IAEE North American Conference, Washington, DC, September 25, 2018.
6. *The Costs and Environmental Impacts of Lithium-Ion Battery Production and Recycling*. International Battery Seminar & Exhibit. Fort Lauderdale, FL, March 26-29, 2018. (Invited)
5. *Evaluating food-energy-water systems with a concurrent assessment method*. Energy Policy Research Conference. Santa Fe, NM, September 8-9, 2016.
4. *Prospects for lithium ion battery recycling in a changing market*. Energy Policy Research Conference. Santa Fe, NM, September 8-9, 2016.
3. *Process-based cost modeling of cylindrical lithium-ion batteries*. ASME Power & Energy Conference & Exhibition: Energy Storage Forum. Charlotte, NC, June 26-30, 2016.
2. *How do different battery chemistries perform in a hybrid microgrid?* ASME Power & Energy Conference & Exhibition: Energy Storage Forum. Charlotte, NC, June 26-30, 2016.
1. *Energy Storage Optimization: A Techno-economic Analysis of Battery Chemistries in Hybrid Microgrids*. USAEE/IAEE North American Conference, Pittsburgh, PA, October 27, 2015.

POSTER PRESENTATIONS

13. Kelsey Bischoch, Rebecca Ciez, *Geospatial and Social Factors Affecting Equitable U.S. Heating Electrification*, USAEE/IAEE North American Conference, October 24-26, 2022
12. Rebecca Ciez, Daniel Steingart, *How cheap can long-duration lithium-ion batteries be?* Andlinger Center Annual Meeting, Princeton, NJ, November 8, 2019.
11. Rebecca Ciez, Daniel Steingart, *How cheap can long-duration lithium-ion batteries be?* Princeton E-affiliates Partnership Retreat, Princeton, NJ, June 11, 2019.
10. Rebecca Ciez, Elke Weber, Daniel Steingart, *How Effective is Expert Judgement for Technology Innovation?* Andlinger Center Advisory Board Meeting, Princeton, NJ, May 2, 2019.
9. Rebecca Ciez, Daniel Steingart, *How cheap can long-duration lithium-ion batteries be?* Andlinger Center Annual Meeting, Princeton, NJ, November 9, 2018.
8. *Recycled batteries for electric vehicles: A first look at EV owner preferences*, Princeton E-affiliates Partnership Retreat, New York, NY, June 13, 2018.

7. *Recycled batteries for electric vehicles: A first look at EV owner preferences*, Carnegie Mellon Innovation with Impact Exhibition, Pittsburgh, PA, April 12, 2018.
6. *Analyzing Food-Energy-Water systems with a concurrent assessment method*, International Conference on Energy Research and Social Science, Sitges, Spain, April 2-5, 2017.
5. *Lithium-ion battery costs: Can manufacturing economies of scale deliver cost goals?* Carnegie Mellon Electrochemical Energy Symposium, Pittsburgh, PA, October 21, 2016.
4. *Lithium-ion battery costs: Using process-based cost modeling to capture the manufacturing costs of recent battery trends*. Carnegie Mellon Energy Week, Pittsburgh, PA, March 14-18, 2016.
3. *Optimizing Energy Storage: A Techno-Economic Analysis for Hybrid Microgrid Systems*. Center for Climate and Energy Decision Making Annual Meeting, Pittsburgh, PA, May 20-21, 2015.
2. *Optimizing Energy Storage: A Techno-Economic Analysis for Hybrid Microgrid Systems*. Engineering Sustainability: Innovation and the Triple Bottom Line, Pittsburgh, PA, April 20, 2015.
1. *The (Not So) Little Engine That Could: Implementing Multifunction Energy Platforms in Uganda*. National Sustainable Design Expo, Washington, DC, April 18-19, 2013.

OTHER PRESENTATIONS

16. *Techno-economic considerations for battery energy storage design*, Oxford Battery Modeling Symposium, Pembroke College, Oxford, UK, March 28, 2023 (Invited)
15. Moderator, [Batteries: What's Next?](#) Purdue Engineering Distinguished Lecture Series Panel, March 23, 2023.
14. *Environmental Impacts of Battery Recycling*, Sustainable Recycling of Critical Materials in Lithium-ion Batteries, National Academies Chemical Sciences Roundtable, March 2, 2023 (Invited)
13. *A Minimal 'Information' Set to Enable Verifiable Theoretical Battery Research*, with Ferran Bosa Panella, Yuimin Zhang, Aashutosh Mistry, Carnegie Mellon Battery Modeling Webinar Series, October 19, 2021.
12. *Assessing the cost limits of lithium-ion batteries*, Carnegie Mellon Battery Modeling Webinar Series, January 12, 2021 (Invited)
11. Purdue Engineering Distinguished Lecture Series Panel: [Thermal and Energy Management Challenges in Large-Scale, Sustainable Computing Systems](#), December 3, 2020
10. *Energy storage for decarbonization goals*, Purdue ECS Student Seminar, October 19, 2020
9. *Designing Energy Storage for Climate Goals*. Dartmouth Arthur L. Irving Institute for Energy & Society New Energy: Conversations with Early-Career Energy Researchers, July 15, 2020 (Invited) Recording: <https://www.youtube.com/watch?v=YwqAdClOpZI&feature=youtu.be>

8. *Energy storage for decarbonization goals*, MIT Alumni for Climate Action Webinar, June 24, 2020 (Invited)
7. *Low-cost grid energy storage: cost limits of lithium-ion batteries*. Columbia Electrochemical Energy Center, New York, NY, September 27, 2019.
6. *Trends in Energy Storage Costs*. Electricity Roundtable: The role of storage in Alberta's electricity market, University of Calgary School of Public Policy, Calgary, AB, March 18, 2019. (Invited) <https://doi.org/10.11575/sppp.v12i0.68824>
5. *Low-cost grid energy storage: cost limits of lithium-ion batteries*. NREL, Golden, CO, March 15, 2019. (Invited)
4. *Lithium-Ion Battery Recycling Processes: Environmental Impacts and Economics*, Decommissioning, End of Life, and Recycling Energy Storage Association Webinar, March 13, 2019. (Invited)
3. *Reducing BEV battery costs: contributions from manufacturing and recycling*. UC Davis Sustainable Transportation Energy Pathways Seminar. June 20, 2017. (Invited)
2. *Policies Shaping Power Africa: Perspectives on Energy Policy for the Developed and Developing World*. ASME Board on Government Relations. November 16, 2014.
1. Panel Moderator, *Early Career Engineer Mini-Talks*. ASME Board on Career Development, November 16, 2014.

TEACHING AND MENTORING EXPERIENCE

Purdue University

PhD Advisees

- Kelsey Biscocho, MSME Spring 2023, Environmental & Ecological Engineering, *expected 2026*
- Ivan Arturo Nuñez Ferro, Environmental & Ecological Engineering, *expected 2027*

Thesis MS Advisees

- Kelsey Biscocho, Mechanical Engineering, *expected Spring 2023*
- Meenakshi Narayanaswami, Mechanical Engineering, *expected Spring 2024*
- Mohammad Aquib Zafar, Mechanical Engineering, *expected Spring 2024*

Courses Taught

- EEE 560 - Scaling New Energy Technologies, Fall 2020
- ME 463 - Engineering Design, Spring 2021
- ME 200 - Thermodynamics I, Fall 2021, Fall 2022
- EEE 430 - Industrial Ecology and Lifecycle Assessment, Spring 2022
- EEE 295 - Engineering, Economics, and Environment, Fall 2022

LEADERSHIP AND SERVICE

Purdue Teaching Academy: Teaching Leadership Award *Promoting Graduate Student Teaching Excellence and Community*, 2023

Review Editor, *Frontiers in Sustainable Energy Policy: Energy and Society* (Fall 2022-present)

Purdue Electrochemical Society Chapter, Advisor, Fall 2021-present

Gordon Research Conference: Batteries, Discussion Leader, June 2022

INFORMS Annual Conference Session Chair, Energy, Natural Resources and the Environment, October 2021, October 2022

Purdue Committees: EEE Graduate Committee (Fall 2020- Spring 2022), ME Grad Committee (Spring 2021-Spring 2022), EEE Academics Committee (Fall 2022-present)

Clean Air Task Force: [Transportation Deep Decarbonization Initiative](#) (2020)

USAEE, Case Competition Writer (2020)

Center for Energy Initiatives Battery and Energy Storage Workshop, Organizing Committee (2019)

Institute for Transformative Technologies, 50 Breakthroughs Scientific Translation Committee (2019)

World Bank Technology Futures Workshop (April 24, 2018)

Reviewer

- US Department of Energy Vehicle Technologies Office (2022), *Bipartisan Infrastructure Law (BIL) Battery Materials Processing and Battery Manufacturing*
- US Department of Energy Vehicle Technologies Office (2019-2022) *Annual Merit Review, Vehicle Technologies Analysis*
- US Department of Energy Advanced Manufacturing Office (2019) *American-Made Lithium-Ion Battery Recycling Prize*
- US Department of Defense Strategic Environmental Research and Development Program (2020) - *Optimization of Advanced Battery Processing and Recycling Technologies*
- Caltrans/US DOT proposals through ITS-UC Davis (2021)
- KU Leuven Research Council (2022)

Journal Reviewer Applied Energy, Energies, Energy, Energy Conversion and Management, Energy Policy, Environmental Science & Technology, Fire, IEEE Open Access Journal of Power and Energy, Joule, Nature Communications, Resources Conservation & Recycling, Science Advances, Sustainable Production and Consumption

ASME

Nominating Committee Voting Member (2018-2020)

Nominating Committee Alternate Member (2017-2018)

Society of Women Engineers

WE Local Pittsburgh Conference Host Committee Chair (2016-2017)

Pittsburgh Section Representative (2016-2017)

MEDIA, COMMENTARIES, AND BLOG POSTS

Democrat & Chronicle: [Trashed no more: How a Rochester site will recycle our EV batteries for a US green surge](#), March 1, 2023

The City: [As Battery Fires Mount, Sanitation Department Scrambles to Deal with the Hazardous Aftermath](#), February 20, 2023

[Human power: how steelworkers could make-or-break the renewable energy transition](#), February 15, 2023

ABC WPTA: [Digging deeper into solar farm facts](#), October 12, 2022

Fox 59 Indianapolis: [Tax credits offered for heat pump installation](#), October 7, 2022

Canary Media: [Energy Dome is the rare long-duration storage firm that's moving fast](#), December 9, 2021

Interchange Recharged Podcast: [The Future of Solar Storage](#), November 26, 2021

S&P Global: [Carmakers try to head off supply crunch with battery recycler investments](#), October 13, 2021

Business Insider: [Why It's so Hard to Recycle Electric-Car Batteries](#), September 30, 2021

S&P Global: [EV Impact: Battery Disruptors are Joining Metal Supply Chains](#), September 21, 2021

ABC WPTA Fort Wayne: [Digging Deeper: Climate Matters](#), August 19, 2021

Eurobiz Japan: [Powering the road to zero](#), July 2021

S&P Global: [Battery recycling efforts pick up as cobalt, lithium face potential deficit](#), June 9, 2021

S&P Global: [Shift to solid-state batteries could be 'seamless,' experts say](#), June 4, 2021

Science Magazine, [Millions of electric cars are coming. What happens to all the dead batteries?](#), May 20, 2021

Volts, [Battery week: competitors to lithium-ion batteries in the grid storage market](#), May 14, 2021

Volts, [The ongoing battle among lithium-ion batteries](#), April 21, 2021

[Comprehensive look at U.S. fuel economy standards show big savings on fuel and emissions](#), August 25, 2020

Spektrum (German): [The Legacy of Electromobility](#), June 9, 2020

S&P Global: [As battery costs plummet, lithium-ion innovation hits limits, experts say](#), May 14, 2020

Andlinger Center Speaks: [Electric vehicles, their batteries, and the road to electric transportation](#), June 17, 2019.

Wired: [VW Will Make Its Own Batteries to Power an Electric Future](#), May 19, 2019

The Wall Street Journal: [The Secret to Why a Tesla Costs So Much \(Hint: Batteries\)](#), February 19, 2019.

Nature Research Sustainability Community: [Behind the paper: Examining different recycling processes for lithium-ion batteries](#), February 11, 2019.

Press Release: [Making green cars greener with battery recycling](#), February 12, 2019.

ARS Technica: [Electric car batteries might be worth recycling, but bus batteries aren't yet](#), February 12, 2019

IEEE Spectrum: [2017 Is the Make-or-Break Year for Tesla's Gigafactory](#), December 30, 2016.

Green Car Congress: [CMU study suggests difficulties in reaching target low price points for Li-ion batteries](#), December 11, 2016.

Charged: [New study: Lithium cost swings unlikely to impact battery prices](#), May 26, 2016.

Clean Technica: [Lithium Price Changes Unlikely to Do Much to EV Battery Prices](#), May 12, 2016.

Green Car Congress: [CMU study concludes lithium market fluctuations unlikely to impact Li-ion battery prices significantly](#), May 5, 2016.